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(71)Applicant : OLYMPUS OPTICAL CO LTD

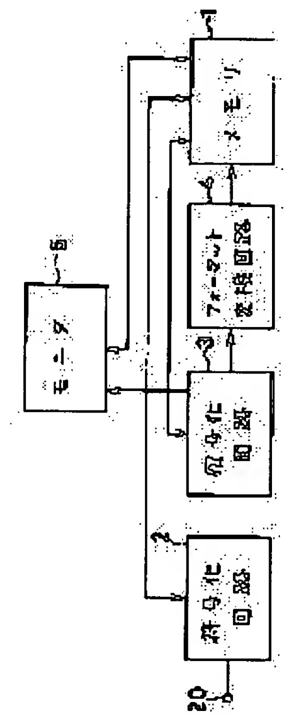
(72)Inventor : YAMADA HIDETOSHI

(54) IMAGE RECORDING/REPRODUCING DEVICE

(57)Abstract:

PURPOSE: To convert an encoded moving image into a still image data so as to edit/reproduce and record in common medium.

CONSTITUTION: This device is provided with a moving image input means 20 for inputting a moving image signal, a data compressing means 2 for data- compressing an inputted moving image signal by a high efficient encoding, a recording means 1 for recording encoded moving image and still image signals, an expanding means 3 for decoding encoded moving image and still image signals and a convering means 4 for converting an encoded moving image signal into a still picture signal. To encode a core frame of a moving image signal, the same encoding method as that for a still image is used.



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JAPANESE [JP,05-007356,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the image recording regenerative apparatus which carries out the data compression of a still picture and the animation, records them, and indicates by playback.
[0002]
[Description of the Prior Art] The so-called multimedia which can treat freely the information on varieties, such as a picture signal besides text data and a sound signal, on a personal computer is used. It is desirable for the both sides of a static image and a dynamic image to be able to treat as an image with such equipment. Moreover, when memorizing an image as digital data, the amount of data will become huge. Then, in order to record in the range of the storage capacity to which much image information was restricted, it is necessary to perform a certain compression to a picture signal. high -- the coding approach which combined orthogonal transformation and variable length coding is widely learned as a compression method of efficiency image data. For example, the outline of the method (JPEG method) currently examined as international standards of a still picture compression method is as follows. Image data is first divided into the block (block which consists of a pixel of 8x8) of predetermined magnitude, and two-dimensional DCT (discrete cosine transform) is performed as orthogonal transformation for every divided block. Next, linear quantization according to each frequency component is performed, and Huffman coding is performed as variable length coding to this quantized value. this time -- a dc component -- being related -- difference with the dc component of the near block -- Huffman coding of the value is carried out. An alternating current component performs Huffman coding to the group of the number to which the scan to the low high frequency component called a zigzag scan from a frequency component is performed and which the component of an invalid (a value is 0) follows, and the value of the effective component following it.
[0003] Moreover, as an animation compression method, the MPEG method is examined as international standards. That is, by this method, the compression in a frame (compression as a still picture) and inter-frame compression (compression using continuous inter-frame prediction) are combined. In the compression in a frame, it encodes like the JPEG method described previously fundamentally combining orthogonal transformation and variable length coding. The frame which performs compression as such a still picture is called a core frame, and is arranged at suitable spacing for inter-frame [continuous]. Such a frame is called I picture.
[0004] On the other hand, in inter-frame compression, from a nearby reference frame, a forecast is computed and the difference of the frame which it is going to encode, and its forecast is encoded combining orthogonal transformation and variable length coding. In order to calculate a forecast from a nearby frame, detecting and predicting a motion of a screen is performed. That is, the physical relationship which is most alike for every block of predetermined magnitude in a reference frame and a coding frame is searched for, and let the location gap be a motion vector. A motion vector is also encoded as a part of sign.
[0005] There is a method using the frame of not only the past frame but the future as a reference frame. That is, three kinds of prediction approaches, the forward prediction by the past frame, the back WORD prediction by the frame of the future, and both average prediction to a pan, can be considered as motion compensation frame prediction. By the MPEG method, the frame (B picture) which chooses and uses the optimal prediction out of three forecasts, the frame (P picture) by forward prediction, forward prediction and back WORD prediction, and both average-value prediction, is used.
[0006]
[Problem(s) to be Solved by the Invention] As mentioned above, in the image recording regenerative apparatus used for multimedia, image data is wanted to be compressible in high efficiency. There are an above-mentioned JPEG method and an above-mentioned MPEG method as a compression method which fills such a demand. However, it is not taken into consideration that the coding method to this static image and the coding method to a dynamic image change both although the amount of that radical headquarters is common. for this reason -- for example, the image encoded as an animation was reproducible only as an animation, a certain coma in an animation was sampled as a still picture, and what is edited, recorded and reproduced was impossible. This spoils the advantage of the multimedia that the information on various can originally be treated freely.
[0007] Then, the place made into the purpose of this invention can change the encoded dynamic image as static-image data except for such a fault, and is to offer the image recording regenerative apparatus which can perform edit and playback, record to a common medium, etc.
[0008]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the image recording regenerative apparatus of this invention An animation input means to input a dynamic-image signal, and the data compression means which carries out the data compression of the inputted dynamic-image signal by high efficiency coding, A record means to record the encoded dynamic-image signal and the encoded static-image signal, In case it has an elongation means to decode the encoded dynamic-image signal and the encoded static-image signal, and a conversion means to change the encoded dynamic-image signal into a static-image signal and the core frame of a dynamic-image signal is encoded, it encodes with the same method as coding of a still picture.
[0009]
[Function] That is, in this invention, in case the core frame of a dynamic-image signal is encoded, it encodes with the same method as coding of a still picture, and still picture data are obtained by format conversion.
[0010]

[Example] The example of this invention using the above principle is explained. The block diagram of the multi-media system which equipped drawing 1 with the image recording regenerative apparatus by this invention is shown. 1 is the memory on which image data is recorded, and is constituted by the magnetic-disk recording device. It is the monitor with which the coding network into which 2 compresses image data, the decryption circuit which elongates the dynamic-image data with which 3 was compressed, and 4 display a format conversion circuit, and 5 displays an image.

[0011] A coding network 2 is equipped with the frame memory 22 which memorizes the input terminal 20 into which a dynamic-image signal is inputted, A/D converter 21 which changes an analog signal into a digital signal, and the digitized signal, the amount prediction circuit 23 of signs, a subtractor circuit 24, the DCT quantization circuit 25, the Huffman coding circuit 26, the inter-frame prediction circuit 27, the adaptation selection circuitry 28, the reverse quantization IDCT circuit 29, and buffer memory 30 as shown in drawing 2 . The amount prediction circuit 23 of signs computes the amount of generating signs of the frame encoded, and sets up quantization width of face based on this. The orthogonal transformation (DCT) quantization circuit 25 performs linear quantization using the quantization width of face for every frequency component which performed DCT as orthogonal transformation for every block, and was further set up beforehand for every frequency component in the image data which is outputted from a frame memory 22, and by which blocking processing was carried out. The Huffman coding circuit 26 carries out Huffman coding of the quantized transform coefficient. The inter-frame prediction circuit 27 asks for the motion vector between a reference frame and a coding frame. The adaptation selection circuitry 28 chooses a reference frame according to the class (I, P, B picture) of frame to encode. The reverse quantization IDCT circuit 29 changes the quantized DCT multiplier into central value, performs reverse DCT conversion further, and restores image data. Buffer memory 30 stores the data by which Huffman coding was carried out.

[0012] Actuation of the image recording regenerative apparatus constituted as mentioned above is explained. For example, the video signal of an animation is inputted into an input terminal 20 from a television camera, it is changed into a digital signal by A/D converter 21, and a frame memory 22 memorizes. Blocking processing is performed in the size of 8x8 from a frame memory 22, and the memorized image data is inputted into a subtractor circuit 24. 0 is subtracted about a core frame here (it continues [namely,] being the HARASHIN number), and it is outputted to the DCT quantization circuit 25. In the DCT quantization circuit 25, after DCT is performed for every block, linear quantization is performed using the quantization width of face for every frequency component. As quantization width of face, according to the amount-of-data information accumulated in buffer memory 30, the forecast by the amount prediction circuit 23 of signs is used here so that the excess and deficiency of data may not arise. In the amount prediction circuit 23 of signs, it asks for activity (parameter which shows the amount of high frequency components) from the data from a frame memory 22. Since activity has the amount of signs, and correlation, from this value, the optimal quantization width of face for encoding data the neither more nor less is set up, and it is used.

[0013] Huffman coding of the quantized transform coefficient is carried out by the Huffman coding circuit 26. this time -- a dc component DC -- being related -- difference with the dc component of the near block -- the Huffman coding which carries out grouping of the value according to that bit length, and shows that group, and difference -- a value is doubled and it considers as coded data. The alternating current component AC performs the scan to the low high frequency component called a zigzag scan from a frequency component, and Huffman coding is performed to the number (the number of runs of zero) which the component of 0 follows, and a group with the group number of the value of the component whose value following it is not 0, and a value doubles the symbolic language and overhead bit which were obtained, and makes it coded data.

[0014] The above-mentioned processing is performed until processing of the block for one frame is completed for every block one by one. To the whole block for one frame, the same quantization width of face is maintained at the time of compression of a core frame, and it encodes here at it.

[0015] Next, when a coding frame is P picture, coding frame data are inputted into the inter-frame prediction circuit 27 from a frame memory 22, and the motion vector between reference frames is called for. I picture before that is used as a reference frame. That is, the data by which linear quantization was carried out after DCT are changed into central value by the reverse quantization IDCT circuit 29, and the image data further restored by reverse DCT conversion is inputted into the inter-frame prediction circuit 27 from the adaptation selection circuitry 28. In the inter-frame prediction circuit 27, between P picture which is a coding frame, and I picture which is a reference frame, the physical relationship from which a correlation value serves as max for every block of predetermined magnitude is searched for, it asks for the location gap as a motion vector, and a motion vector is encoded. Then, the motion compensation of the inter-frame prediction circuit 27 is carried out by the motion vector which was able to ask for I picture which is a reference frame, and it is outputted to a subtractor circuit 24. P picture which is a coding frame in a subtractor circuit 24, and I picture which is a reference frame are subtracted, and it is outputted to the DCT quantization circuit 25.

[0016] In the DCT quantization circuit 25, after DCT is performed for every block, linear quantization is performed using the quantization width of face for every frequency component. By the Huffman coding circuit 26, DC and AC are fair and Huffman coding of the quantized transform coefficient is carried out.

[0017] Moreover, when a coding frame is B picture, image data is inputted into the inter-frame prediction circuit 27 from a frame memory 22 like the case of P picture, and the motion vector between reference frames is called for. As a reference frame, I picture or P picture before and behind that is used. The restoration image data of the corresponding reference frame is inputted into the inter-frame prediction circuit 27 from the adaptation selection circuitry 28. In the inter-frame prediction circuit 27, the past frame, the frame of the future, and a pan are asked for three kinds of motion vectors of both average value, and the optimal prediction is chosen from B picture which is a coding frame, I picture which is a reference frame, or P picture with an evaluation value. A motion compensation is carried out by the motion vector of optimal prediction asked for the selected reference frame, and it is outputted to a subtractor circuit 24. B picture and the reference frame which are a coding frame in a subtractor circuit 24 are subtracted, and it is outputted to the DCT quantization circuit 25. In the DCT quantization circuit 25, after DCT is performed for every block, linear quantization is performed using the quantization width of face for every frequency component. Huffman coding of the quantized transform coefficient is carried out by the Huffman coding circuit 26 like the time of a core frame.

[0018] The data header specified to the data encoded while the above processing was performed one by one and the inputted animation signal was encoded by the MPEG method is added. That is, although the file in an MPEG method has composition as shown in drawing 3 (A), the header about a format of an image including the number of pixels, a quantization matrix, etc. is added to a video sequence here. A location and coding type header is added to the macro block of the scale factor of quantization at the GRU PUOBU picture at the picture of edit information to a playback sequence and coding type slice, respectively. The code data to which the header was added is transmitted and recorded on memory 1 (drawing 2) from buffer memory 30.

[0019] Then, the actuation in the case of using a certain coma in the compressed dynamic-image data as a still picture is explained. The compressed dynamic-image data which are recorded on memory 1 are sent to the decryption circuit 3, and are reproduced by the next actuation. That is, in the circuitry of a coding network 3 shown in drawing 4 , the data stored in the buffer memory 31 in a decryption circuit temporarily are sent to the Huffman decryption circuit 32, and a dc component and an alternating current component are decoded. The DCT multiplier quantized in the reverse quantization IDCT circuit 33 is changed into central value, and reverse DCT conversion of the decoded data is carried out further. A value with the restored data as it is in the case of a core frame is outputted to the adaptation selection circuitry 34. Moreover, in the case of P picture or B picture, in an adder circuit 35, it is added with reference frame data. I picture or P picture already decoded as a reference frame here is outputted from the adaptation selection circuitry 34, and a motion compensation is carried out in the motion compensation circuit 36, and it is used.
[0020] Although the image decoded as mentioned above is reproduced by the monitor 5, when there is an image to extract as a still picture in this, the core frame corresponding to it is chosen. The coded data of this core frame is outputted to the format conversion circuit 4 from buffer memory 31. The core frame data by which Huffman coding is carried out are made to correspond to JPEG specification in the format conversion circuit 4. That is, since the SOI code which shows the start of image data, a frame header including a coding type or the number information of pixels, the DQT code which defines a quantization matrix, the DHT code which defines a Huffman-coding table, the scanning header which shows correspondence of a color component, the EOI code which shows the image end of data are need as shown in a JPEG file at drawing 3 (B), these headers are created and it is outputted to memory 1.
[0021] On the other hand, the quantized transform coefficient is expressed with Huffman coding about coded data. Huffman coding of the quantized transform coefficient is carried out by the Huffman coding circuit 26. this time -- a dc component DC -- being related -- difference with the dc component of the near block -- the Huffman coding which carries out grouping of the value according to that bit length, and shows that group, and difference -- a value is doubled and it considers as coded data. The alternating current component AC performs the scan to the low high frequency component called a zigzag scan from a frequency component, and Huffman coding is performed to the number (the number of runs of zero) which the component of 0 follows, and a group with the group number of the value of the component whose value following it is not 0, and a value doubles the symbolic language and overhead bit which were obtained, and makes it coded data. Thus, since the DS of JPEG is the same expression as the core frame of MPEG, it is easily convertible.
[0022] Thus, the still picture compressed data recorded on memory 1 follows the specification for still picture compression, and can perform edit and playback completely like the data compressed from the usual still picture. In addition, although the optimal quantization width of face shall be set up in the amount prediction circuit 23 of signs using activity in previous explanation, you may make it this set up the optimal quantization width of face by this not only in quest of activity but in quest of the amount of signs actual, for example.
[0023] Next, the 2nd example of this invention is explained. Drawing 5 shows the block diagram of the image recording regenerative apparatus of the 2nd example. In this example, the memory card 40 which built in semiconductor memory besides the memory 1 which consists of a magnetic-disk recording device as memory which records image data is added, and the attachment and detachment of a memory card 40 to the socket prepared in the body of an image recording regenerative apparatus are enabled. This memory card 40 is used as a record medium of the electronic camera which picturizes a still picture. It is the monitor with which the coding network into which 2 compresses image data, the decryption circuit which elongates the dynamic-image data with which 3 was compressed, and 4 display a format conversion circuit, and 5 displays an image. 6 is a decryption circuit which elongates static-image data. Since the internal configuration of a coding network or a decryption circuit is the same as that of the 1st example, explanation is omitted.
[0024] Actuation of the image recording regenerative apparatus of drawing 5 is explained with reference to drawing 2 . The video signal of an animation is inputted, it is changed into a digital signal by A/D converter 21, and a frame memory 22 memorizes. Blocking processing is performed from a frame memory 22, and the memorized image data is inputted into a subtractor circuit 24. About a core frame, it is outputted to the DCT quantization circuit 25 with the HARASHIN number. In the DCT quantization circuit 25, after DCT is performed for every block, linear quantization is performed using the quantization width of face for every frequency component. As quantization width of face, it is used here according to the amount-of-data information accumulated in buffer memory 30, setting up quantization width of face which the excess and deficiency of data do not produce. Huffman coding of the quantized transform coefficient is carried out by the Huffman coding circuit 26. The above-mentioned processing is performed until processing of the block for one frame is completed for every block one by one. At the time of compression of a core frame, it encodes by the same quantization width of face to the whole block for one frame here.
[0025] Next, when a coding frame is P picture, coding frame data are inputted into the inter-frame prediction circuit 27 from a frame memory 22, and the motion vector between reference frames is called for. I picture before that is used as a reference frame. The motion compensation of the inter-frame prediction circuit 27 is carried out by the motion vector which was able to ask for I picture which is a reference frame, and it is outputted to a subtractor circuit 24. P picture which is a coding frame in a subtractor circuit 24, and I picture which is a reference frame are subtracted, and it is outputted to the DCT quantization circuit 25. In the DCT quantization circuit 25, after DCT is performed for every block, linear quantization is performed using the quantization width of face for every frequency component. Huffman coding of the quantized transform coefficient is carried out by the Huffman coding circuit 26 like the time of a core frame.
[0026] Moreover, when a coding frame is B picture, image data is inputted into the inter-frame prediction circuit 27 from a frame memory 22 like the case of P picture, and the motion vector between reference frames is called for. As a reference frame, I picture or P picture before and behind that is used. A motion compensation is carried out by the motion vector of optimal prediction asked for the selected reference frame, and it is outputted to a subtractor circuit 24. B picture and the reference frame which are a coding frame in a subtractor circuit 24 are subtracted, and it is outputted to the DCT quantization circuit 25. In the DCT quantization circuit 25, after DCT is performed for every block, linear quantization is performed using the quantization width of face for every frequency component. Huffman coding of the quantized transform coefficient is carried out by the Huffman coding circuit 26 like the time of a core frame.
[0027] The above processing is performed one by one and the inputted animation signal is encoded. The data header specified by the MPEG method is added, and the encoded data are recorded on memory 1 (drawing 5) from buffer memory 30. Moreover, the compressed video data may be transmitted and recorded on a memory card 40 here. The storage capacity of a memory card 40 is several megabytes, and can record the dynamic image for several seconds. In record of the animation coded data to a memory card 40, if it is made to record for every GRU PUOBU picture which is the unit of a data configuration, record, edit, playback, etc. can be performed efficiently.
[0028] The actuation in the case of on the other hand using a certain coma in the compressed dynamic-image data as a still picture is explained. The compressed dynamic-image data which are recorded on memory 1 are stored in the buffer memory in the decryption circuit 3 temporarily. The image decoded by the decryption circuit 3 is reproduced by the monitor 5, and the core frame corresponding to it in the

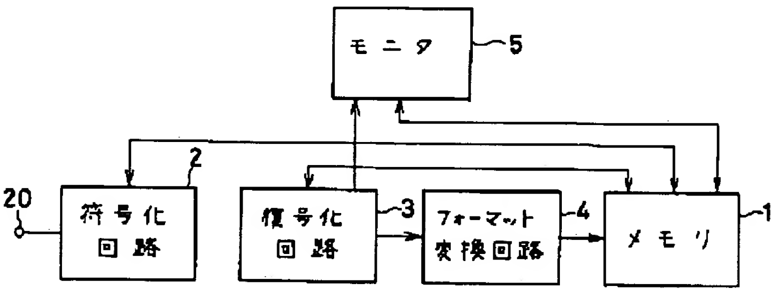
image extracted as a still picture in this is chosen. The coded data of this core frame is outputted to the format conversion circuit 4 from buffer memory. In the format conversion circuit 4, the core frame data by which Huffman coding is carried out are made to correspond to JPEG specification, the data header which includes quantization width-of-face information etc. further is created, and it outputs to buffer memory 30. Transfer record of the obtained still picture code data is carried out at a predetermined memory card.
[0029] In this example, the memory card usually used as a record medium of an electronic camera is used as a record medium. For this reason, the image picturized with the electronic camera is easily reproducible on a monitor 5 by inserting a memory card and decoding by the decryption circuit 6. Moreover, a coma in a dynamic image is changed into a still picture, and it can record on the memory card for still pictures. The dynamic image furthermore compressed can also be recorded on a memory card, and the description of multimedia can be harnessed more.
[0030] As mentioned above, in case the core frame of a dynamic-image signal is encoded in this invention, it is encoding with the same method as coding of a still picture, and still picture data are obtained by format conversion, so that clearly. For example, although keeping quantization width of face constant within a frame is not taken into consideration by the usual MPEG method when compressing a dynamic image with an MPEG method, the still picture data corresponding to a JPEG method are obtained by this invention by encoding without changing quantization width of face at the time of compression of a core frame.
[0031]
[Effect of the Invention] As explained above, in the image recording regenerative apparatus of this invention, record, edit, and playback can be performed completely like the data compressed from the usual still picture in a coma in a dynamic image. Where data are encoded, in order to perform conversion to a still picture from an animation according to the method of this invention, once decrypting an animation, image quality degradation by the compressive repeat does not arise like [in the case of compressing again as a still picture].

[Translation done.]

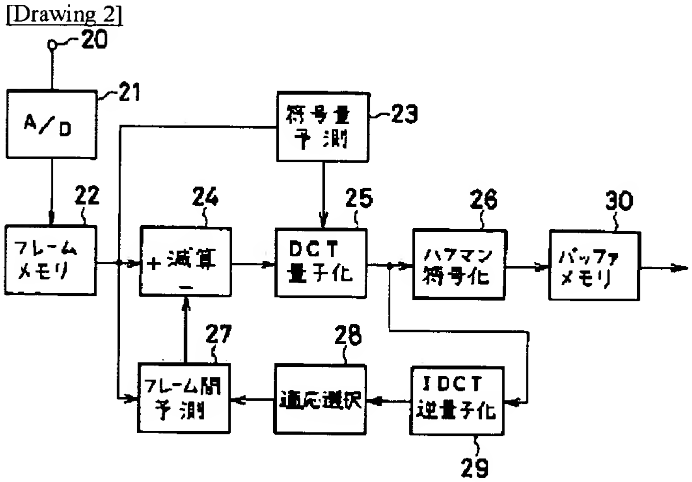
* NOTICES *

DRAWINGS

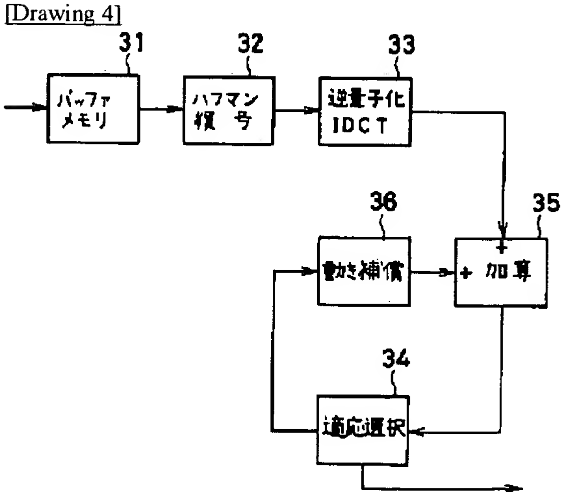
[Drawing 1]



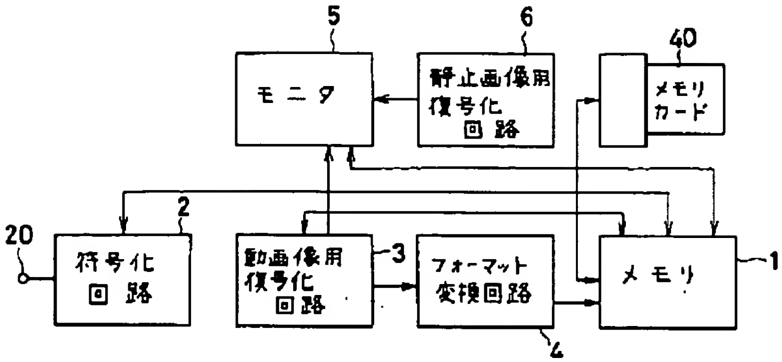
[Drawing 2]



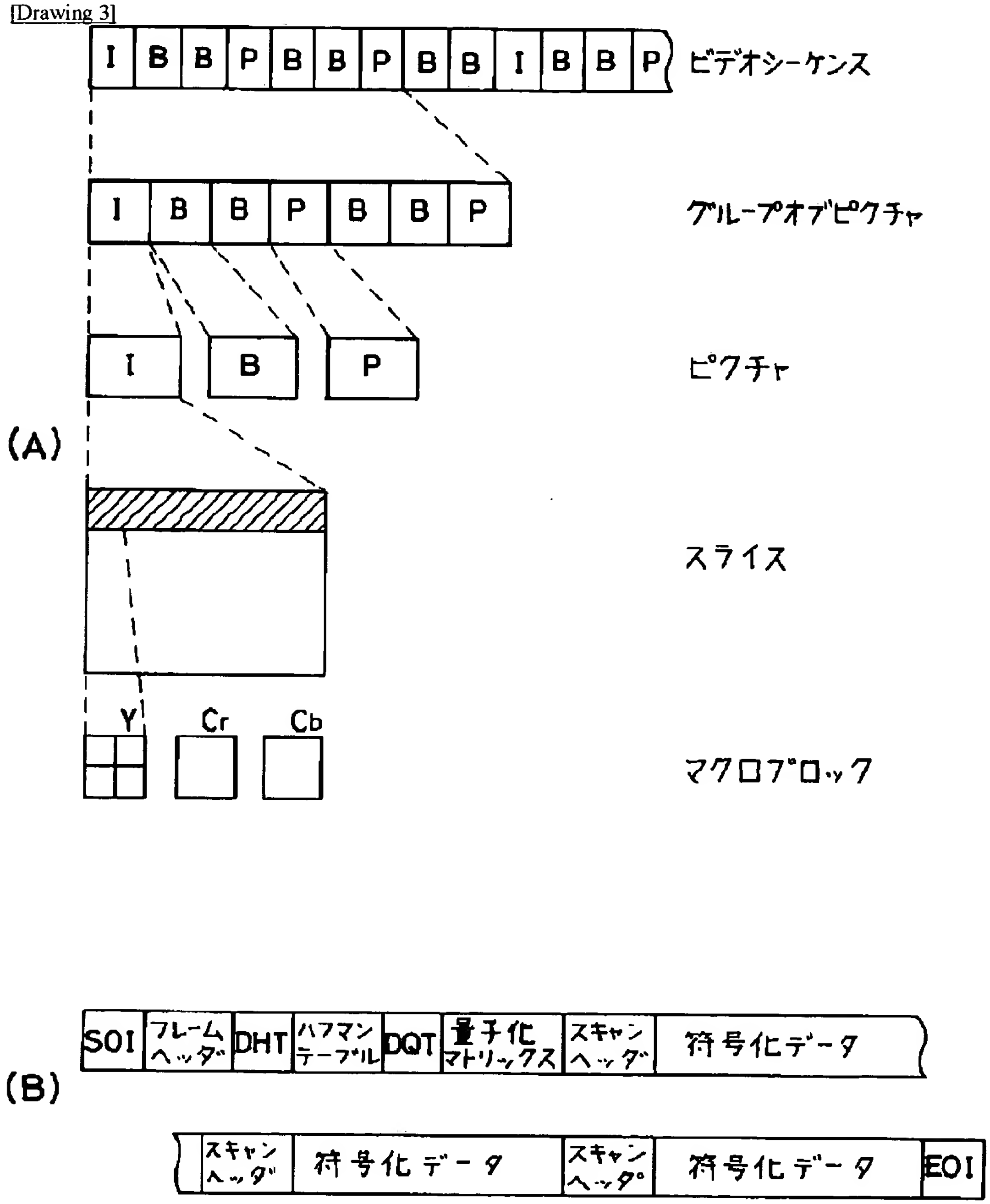
[Drawing 4]



[Drawing 5]



[Drawing 3]



[Translation done.]